MATHS

BOOKS - ARIHANT MATHS (ENGLISH)

TRIGONOMETRIC EQUATIONS AND INEQUATIONS

Examples

1. If $\sin\alpha$, 1, $\cos 2\alpha$ are in GP, then find the general solution for α

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2. If $\dfrac{1}{6}\sin\theta$, $\cos\theta$ and $\tan\theta$ are in G.P. then the general solution for θ is

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3. Solve $\sin^2 \theta - \cos \theta = \dfrac{1}{4}$, $0 \le \theta \le 2\pi$.

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4. Solve $\cos \theta + \cos 7\theta + \cos 3\theta + \cos 5\theta = 0$,

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5. Find the number of solution for , $\sin 5\theta \cdot \cos 3\theta = \sin 9\theta \cdot \cos 7\theta$ in $\left[0, \dfrac{\pi}{2}\right]$

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6. Solve $\dfrac{\sin x + i \cos x}{1 + i}$, $i = \sqrt{-1}$ when it is purely imaginary .

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7. Find the most general solution of $2^1|\cos x| + \cos^2 x + |\cos x|^{3+\infty} = 4$

8. If $x \neq \dfrac{n\pi}{2}$, $n \in I$ and $(\cos x)^{\sin^2 x - 3\sin x + 2} = 1$, then find the general solution of x.

9. Solve $\dfrac{\tan 3x - \tan 2x}{1 + \tan 3x \tan 2x} = 1$.

10. Solve $\sin x = 0$ and $\dfrac{\sin x}{\cos \frac{x}{2} \cos \frac{3x}{2}} = 0$ and show their solutions are different .

11. Find the number of solution of $\tan x + \sec x = 2\cos x$ in $[0, 2\pi]$

12. Solve $\sec x - 1 = \left(\sqrt{2} - 1\right)\tan x$

13. Solve $\tan\theta + \tan 2\theta + \tan\theta \cdot \tan 2\theta \cdot \tan 3\theta = 1$

14. Find the number of solutions of $|\cos x| = \sin x, 0 \le x \le 4\pi$

15. Solve $\cot \theta = \sin 2\theta$ by substituting $\sin 2\theta = \dfrac{2\tan\theta}{1+\tan^2\theta}$ and again by substituting $\sin 2\theta = 2\sin\theta \cdot \cos\theta$ and check whether the two answer are same or not .

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16. Prove that the equation $p\cos x - q\sin x = r$ admits solution for x only if $-\sqrt{p^2 + q^2} < r < \sqrt{p^2 + q^2}$

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17. Solve the equation $\sqrt{3}\cos x + \sin x = \sqrt{2}.$

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18. Find the number of distinct solution of $\sec x + \tan x = \sqrt{3}$, where $0 \le x \le 3\pi$

19. Prot that the equation $k \cos x - 3 \sin x = k + 1$ possess a solution if $k \in (-\infty, 4]$.

20. Let [x] = the greatest integer less than or equal to x and let $f(x) = \sin x + \cos x$. Then the most general solution of $f(x) = \left[f\left(\frac{\pi}{10}\right) \right]$ is

21. Find the number of solutions of $\cos x = |1 + \sin x|, 0 \le x \le 3\pi$

22. Solve the following equation:

$$3\cos^2\theta - 2\sqrt{3}\sin\theta\cos\theta - 3\sin^2\theta = 0$$

23. Solve the equation $5\sin^2 x - 7\sin x \cos x + 16\cos^2 x = 4$

24. Solve the equation $(\cos x - \sin x)\left(2\tan x + \dfrac{1}{\cos x}\right) + 2 = 0$

25. Solve : $\sin^{10} x + \cos^{10} x = \dfrac{29}{16}\cos^4 2x$

26. Solve the equation $\sin x + \cos x - 2\sqrt{2}\sin x \cos x = 0$

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27. Find the most general value of θ which satisfies the equation $\sin\theta = \dfrac{1}{2}$ and $\tan\theta = \dfrac{1}{\sqrt{3}}$

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28. If $\tan(A - B) = 1$, and $\sec(A + B) = \dfrac{2}{\sqrt{3}}$, find the smallest positive values of A and B and also their most general values.

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29. If $x + y = 2\pi/3$ and $\sin x / \sin y = 2$, then the general solution for x and y

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30. If $r > 0,\ -\pi \le \theta \le \pi$ and r, θ satisfy $r\sin\theta = 3$ and $r = 4(1 + \sin\theta)$, then find the possible solutions of the pair (r, θ)

31. The equation $2\cos^2\left(\dfrac{x}{2}\right)\sin^2 x = x^2 + \dfrac{1}{x^2}, 0 \le x \le \dfrac{\pi}{2}$ has

32. General solution of equation $\sin^6 x = 1 + \cos^4 3x$

33. solve $\sin^4 x = 1 + \tan^8 x$

34. Solve $\sin^2 x + \cos^2 y = 2\sec^2 z$

35. The number of real solution of the equation $\sqrt{1 + \cos 2x} = \sqrt{2}\sin^{-1}(\sin x)$, $-\pi \le x \le \pi$, is

36. Find the most general solution for $2^{\sin x} + 2^{\cos x} = 2^{\left(1 - \left(\frac{1}{\sqrt{2}}\right)\right)}$

37. Solve $\left|\sqrt{3}\cos x - \sin x\right| \ge 2$ for $x \in [0, 4\pi]$.

38. Show that the equation , $\sin x = [1 + \sin x] + [1 - \cos x]$ has no solution for $x \in R$. (where [.] represents greatest integers functions).

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39. Find the solution set of the inequality $\sin x > \dfrac{1}{2}$.

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40. Find the solution set of the inequality $\cos x \geq \dfrac{-1}{2}$.

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41. Number of solutions of the equation $\sin^4 x - \cos^2 x \sin x + 2 \sin^2 x + \sin x = 0$ in $0 \leq x \leq 3\pi$ is _____.

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42. Solve : $2\cos^2\theta + \sin\theta \leq 2$, where $\pi/2 \leq \theta \leq 3\pi/2$.

43. Solve $\sin^2\theta > \cos^2\theta$.

44. Find the solution set for , $|\tan x| \leq 1$ when $x \in [-\pi, \pi]$

45. Solve the inequality $\sin 2x > \sqrt{2}\sin^2 x + \left(2 - \sqrt{2}\right)\cos^2 x$

46. Solve $\tan^3 x + 3 > 3\tan x + \tan^2 x$.

47. The number of solution of equation $8\left[x^2 - x\right] + 4[x] = 13 + 12[\sin x], [.\,]$ denotes GIF is

A. (a)0

B. (b)2

C. (c)4

D. (d)6

Answer: A

48. The total number of ordered pairs (x, y) satisfying $|x| + |y| = 2, \sin\left(\dfrac{\pi x^2}{3}\right) = 1,$ is equal to 2 (b) 3 (c) 4 (d) 6

A. 1

B. 2

C. 4

D. 3

Answer: D

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49. Solve the equation:

$$\cos^2\left[\frac{\pi}{4}\left(\sin x + \sqrt{2}\cos^2 x\right)\right] - \tan^2\left[x + \frac{\pi}{4}\tan^2 x\right] = 1$$

A. 1

B. 2

C. 4

D. 8

Answer: B

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50. the general solution of $\sin^2\theta\sec\theta + \sqrt{3}\tan\theta = 0$ is

A. $\theta = n\pi + (-1)^{n+1}\dfrac{\pi}{3}, \theta = n\pi, n \in I$

B. $\theta = n\pi, n \in I$

C. $\theta = \dfrac{n\pi}{2}, n \in I$

D. $\theta = n\pi + (-1)^{n+1}\dfrac{\pi}{3}, n \in I$

Answer: B

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51. The number of solutions of the equation

$\sin\left(\dfrac{\pi x}{2\sqrt{3}}\right) = x^2 - 2\sqrt{3}x + 4$

A. 0

B. 2

C. more than 2

D. 1

Answer: D

52. x_1 and x_2 are two solutions of the equation $e^x \cos x = 1$, The minimum number of the solution of the equation $e^x \sin x = 1$, lying between x_1 and x_2 can be

A. 0

B. 1

C. 3

D. None of these

Answer: B

53. The product of common differences of all possible AP which are made from values of 'x' satisfying $\cos^2\left(\frac{1}{2}\lambda x\right) + \cos^2\left(\frac{1}{2}\mu x\right) = 1$

A. $\dfrac{4\pi^2}{\lambda^2 - \mu^2}$

B. $\dfrac{4\pi}{\lambda - \mu}$

C. $\dfrac{2\pi^2}{\lambda^2 - \mu^2}$

D. None of these

Answer: A

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54. Number of solutions of the equation $\cos^4 2x + 2\sin^2 2x$

$= 17(\cos x + \sin x)^8, 0 < x < 2\pi$ is

A. 4

B. 8

C. 10

D. 16

55. The number of values of θ in the interval $\left(-\dfrac{\pi}{2}, \dfrac{\pi}{2}\right)$ satisfying the equation $\left(\sqrt{3}\right)^{\sec \,\hat{}\, (2\theta)} = \tan^4 \theta + 2\tan^2 \theta$ is 2 (b) 4 (c) 0 (d) 1

A. 2

B. 4

C. 0

D. 1

56. Number of solutions of the equation $\cot(\theta) + \cot\left(\theta + \dfrac{\pi}{3}\right) + \cos\left(\theta - \dfrac{\pi}{3}\right) + \cot(3\theta) = 0$, where $\theta \in \left(0, \dfrac{\pi}{2}\right)$

A. Infinite

B. 0

C. 1

D. None of these

Answer: C

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57. $0 < a < 2\pi$, $\sin^{-1}(\sin a) < x^2 - 2x$ for all $x \in I$ then $a \in$

A. $(0, \pi + 1)$

B. $\left(\pi + 1, \dfrac{3\pi}{2}\right)$

C. $\left(\dfrac{3\pi}{2}, 2\pi - 1\right)$

D. $(2\pi - 1, 2\pi)$

Answer: B::C

58. If $\left(\cos^2 x + \dfrac{1}{\cos^2 x} \right) \left(1 + \tan^2 2y \right) \left(3 + \sin 3z \right) = 4$, then

A. x may be a multiple of pi

B. x cannot be an even number of π

C. z can be a multiple of π

D. y can be a multiple of $\dfrac{\pi}{2}$

Answer: A::D

59. Solve $\dfrac{\sqrt{5} - 1}{\sin x} + \dfrac{\sqrt{10 + 2\sqrt{5}}}{\cos x} = 8, x \in \left(0, \dfrac{\pi}{2} \right)$

A. $\dfrac{\pi}{10}$

B. $\dfrac{3\pi}{10}$

C. $\dfrac{9\pi}{10}$

D. $\dfrac{7\pi}{10}$

Answer: A::B

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60. find the range of values of t for which $2\sin t = \dfrac{1 - 2x + 5x^2}{3x^2 - 2x - 1}$

A. $\left[-\dfrac{\pi}{2}, \dfrac{\pi}{2} \right]$

B. $\left[\dfrac{3\pi}{10}, \dfrac{\pi}{2} \right]$

C. $\left[-\dfrac{\pi}{2}, \dfrac{\pi}{10} \right] \cup \left[\dfrac{3\pi}{10}, \dfrac{\pi}{2} \right]$

D. All of these

Answer: A::B::C::D

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61. The system of equations $\tan x = a \cot x$, $\tan 2x = b \cos y$

A. Cannot have a solution if a=0

B. Cannot have a solution if a=1

C. Cannot have a solution if $2\sqrt{a} > |b(1-a)|$

D. has a solution of all a and b

Answer: B::C

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62. If $\dfrac{y+3}{2y+5} = \sin^2 x + 2\cos x + 1$, then the value of y lies in the interval $\left(-\infty, -\dfrac{8}{3}\right)$ (b) $\left(-\dfrac{12}{5}, \infty\right)$ $\left(-\dfrac{8}{3}, -\dfrac{12}{5}\right)$ (d) $\left(-\dfrac{8}{3}, \infty\right)$

A. $\left(-\infty, -\dfrac{8}{3}\right]$

B. $\left[-\dfrac{12}{5}, \infty\right)$

C. $\left[-\dfrac{8}{3}, -\dfrac{12}{5} \right]$

D. $\left(-\infty, -\dfrac{8}{3} \right] \cup \left[-\dfrac{12}{5}, \infty \right)$

Answer: A::B::D

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63. Which of the following set of values of x satisfies the equation

$$2^{\left(2\sin^2 x - 3\sin x + 1 \right)} + 2^{\left(2 - 2\sin^2 x + 3\sin x \right)} = 9 ?$$

A. $x = n\pi \pm \dfrac{\pi}{6}, n \in I$

B. $x = n\pi \pm \dfrac{\pi}{3}, n \in I$

C. $x = n\pi, n \in I$

D. $x = 2n\pi + \dfrac{\pi}{2}, n \in I$

Answer: A::D

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64. For $0 < \theta < \dfrac{\pi}{2}$, the solution (s) of

$$\sum_{m=1}^{6} \cos ec\left(\theta + \left((m-1)\dfrac{\pi}{4}\right)\right)\cos ec\left(\theta + \dfrac{m\pi}{4}\right) = 4\sqrt{2} is(are) \quad \text{(a)} \quad \dfrac{\pi}{4}$$

(b) $\dfrac{\pi}{6}$ (c) $\dfrac{\pi}{12}$ (d) $\dfrac{5\pi}{12}$

A. $\dfrac{\pi}{4}$

B. $\dfrac{\pi}{6}$

C. $\dfrac{\pi}{12}$

D. $\dfrac{5\pi}{12}$

Answer: C::D

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65. If $\dfrac{1 + \sin 6^\circ}{\cos 6^\circ} = \tan A = \sqrt{\dfrac{1 + \sin B}{1 - \sin B}}$, where A and $B \in (0, 90^\circ)$,

then

A. A=8B

B. 8A=B

C. A=7B=6°

D. $A + B = 54°$

Answer: A::C::D

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66. If $\sqrt{1 + \sin A} - \sqrt{1 - \sin A} = 2\cos\dfrac{A}{2}$, then value of A can be

(a)$110°$ (b)$260°$ (c)$300°$ (d)$190°$

A. $110°$

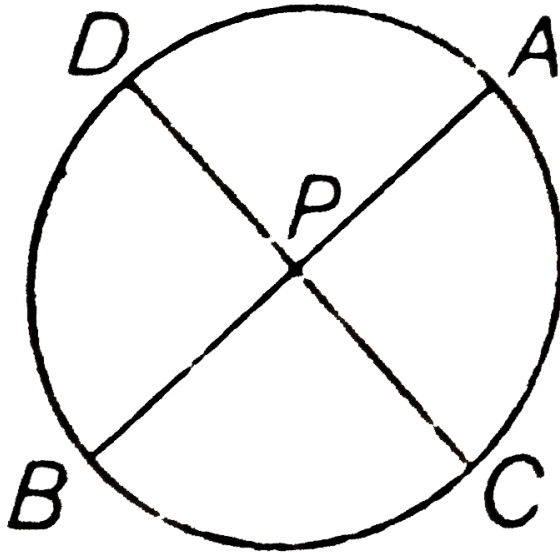B. $260°$

C. $300°$

D. $190°$

Answer: A::B::D

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67. Consider a circle , in which a point P is lying inside the circle such that $(PA)(PB) = (PC)(PD)$ (as shown in figure) .

On the basis of above information , answer the question:

Let PA=4 , PB=3 cm and CD is diameter of the circle having the length 8 cm. If $PC > PD$, then $\dfrac{PC}{PD}$ is equal to
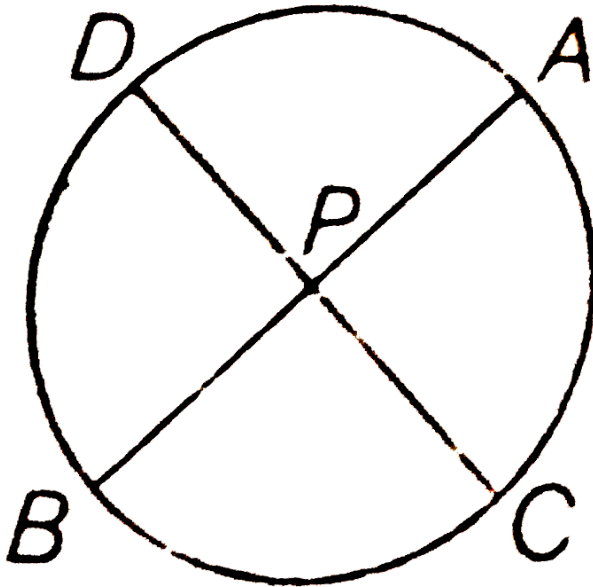
A. (a) 3

B. (b) 4

C. (c) 5

D. (d) 6

Answer: A

68. Consider a circle , in which a point P is lying inside the circle such that $(PA)(PB) = (PC)(PD)$ (as shown in figure) .

On the basis of above information , answer the questions

If $PA = |\cos\theta + \sin\theta|$ and $PB = |\cos\theta - \sin\theta|$, then maximum value of (PC)(PD) , is equal to
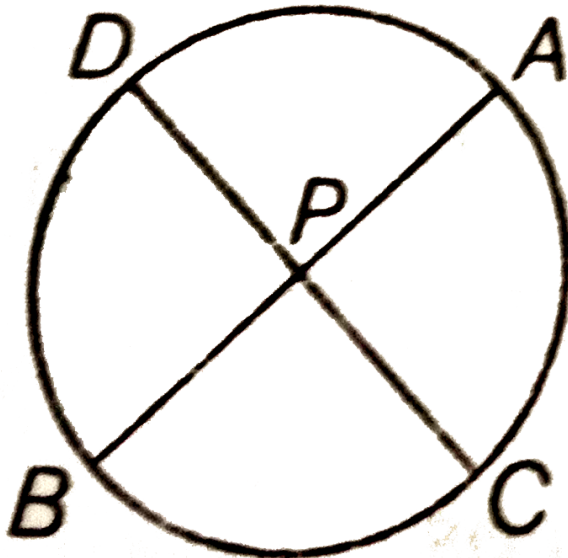
A. (a)1

B. (b)$2\sqrt{2}$

C. (c)$\sqrt{2}$

D. (d)2

Answer: A

69. Consider a circle , in which a point P is lying inside the circle such that

$(PA)(PB) = (PC)(PD)$ (as shown in figure) .

On the basis of above information , answer the questions

If $\log_{PA} x = 2$, $\log_{PB} x = 3$, $\log_x PC = 4$, then $\log_{PD} x$ is equal to

A. (a) $\dfrac{7}{12}$

B. (b) $\dfrac{12}{7}$

C. (c) $-\dfrac{7}{12}$

D. (d) $-\dfrac{6}{19}$

Answer: D

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70. PA and PB are two tangents drawn from point P to circle of radius 5 . A line is drawn from point P which cuts at C and D such that PC=5 and PD=15 and $\angle APB = \theta$.

On the basis of above information answer the questions .

Area of $\triangle APB$ is

A. A. $\dfrac{25\sqrt{3}}{2}$

B. B. $25\sqrt{3}$

C. C. $\dfrac{75\sqrt{3}}{2}$

D. D. $\dfrac{75\sqrt{3}}{4}$

Answer: D

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71. PA and PB are two tangents drawn from point P to circle of radius 5 . A

line is drawn from point P which cuts at C and D such that PC=5 and PD=15

and $\angle APB = \theta$.

On the basis of above information answer the questions .

value of sin2theta + cos4theta +sin5theta+tan7theta +cos 8theta

A. $\dfrac{4\sqrt{3} - 1}{2}$

B. $\dfrac{4\sqrt{3} - 1}{2\sqrt{3}}$

C. $\dfrac{4\sqrt{3} + 1}{2\sqrt{3}}$

D. $\dfrac{4\sqrt{3} + 1}{2}$

Answer: B

72. PA and PB are two tangents drawn from point P to circle of radius 5 . A line is drawn from point P which cuts at C and D such that PC=5 and PD=15 and $\angle APB = \theta$.

On the basis of above information answer the questions .

Number of solution(s) of the equation $\log_{\cos\theta}(x + 2) = 2 + 3\log_{(x+2)} \sin\left(\dfrac{5\theta}{2}\right)$ is

A. 0

B. 1

C. 2

D. 3

Answer: C

73. $3\sin^2 x - 7\sin x + 2 = 0$, $x \in \left[0, \dfrac{\pi}{2}\right]$ and $f_n(\theta) = \sin^n \theta + \cos^n \theta$.

On the basis of above information, the value of $f_4(x)$ is:

A. (a) $\dfrac{97}{81}$

B. (b) $\dfrac{57}{81}$

C. (c) $\dfrac{65}{81}$

D. (d) $\dfrac{73}{81}$

Answer: C

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74. $3\sin^2 x - 7\sin x + 2 = 0$, $x \in \left[0, \dfrac{\pi}{2}\right]$ and $f_n(\theta) = \sin^n \theta + \cos^n \theta$.

On the basis of above information, the value of $\dfrac{\sin 5x + \sin 4x}{1 + 2\cos 3x}$ is:

A. (a) $\dfrac{3 + 2\sqrt{2}}{9}$

B. (b) $\dfrac{3 + 4\sqrt{2}}{9}$

C. (c) $\dfrac{4\sqrt{2} - 2}{9}$

D. (d) $\dfrac{4\sqrt{2} - 3}{9}$

Answer: B

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75. Number of integral solution of the equation $\log_{\sin x} \sqrt{\sin^2 x} + \log_{\cos x} \sqrt{\cos^2 x} =$, where $x \in [0, 6\pi]$ is

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76. If $x_k = (\sec\theta)^{\frac{1}{2^k}} + (\tan\theta)^{\frac{1}{2^k}}$ and $y_k = (\sec\theta)^{\frac{1}{2^k}} - (\tan\theta)^{\frac{1}{2^k}}$, then value of $3y_n \displaystyle\prod_{k=0}^{n} (x_k)$ is equal to

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77. The number of ordered pairs (α, β) , where $\alpha, \beta \in [0, 2\pi]$ satisfying $\log_{2 \sec x} (\beta^2 - 6\beta + 10) = \log_3 |\cos \alpha|$ is

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78. If $\dfrac{\cos^3 \theta}{(1 - \sin \theta)} + \dfrac{\sin^3 \theta}{(1 + \cos \theta)} = 1 + \cos \theta$, then number of possible values of θ is (where $\theta \in [0, 2\pi]$)

A. 5

B.

C.

D.

Answer: $\theta = \dfrac{\pi}{2}$ which is not possible.

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79. If the sum of all value of x satisfying the system of equations

$$\tan x + \tan y + \tan x \cdot \tan y = 5$$

$$\sin(x + y) = 4 \cos x \cdot \cos y$$

is $\dfrac{k\pi}{2}$, where $x \in \left(0, \dfrac{\pi}{2}\right)$ then find the values of k .

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80. Statement I $x = \dfrac{k\pi}{13}, k \in I$ does not represent the general solution

of trigonometric equation.

$$\sin 13x - \sin 13x \cos 2x = 0$$

Statement II Both $x = r\pi, r \in I$ and $x = \dfrac{k\pi}{13}, k \in I$ satisfies the

trigonometric equation.

$$\sin 13x - \sin 13x \cos 2x = 0$$

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81. Find $\dfrac{dy}{dx}$ if $2x - 3y = \sin x - \cos x$

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82. If $0 \le x \le 3\pi, 0 \le y \le 3\pi$ and $\cos x \cdot \sin y = 1$, then find the possible number of values of the orederd pair (x,y) .

83. If $\theta \in [0, 3\pi]$ and $r \in R$. Then , find the pair of (r, θ) satisfying $2 \sin \theta = r^4 - 2r^2 + 3$.

84. Find all the value of θ satisfying the equation , $\sin 7\theta = \sin \theta + \sin 3\theta$ such that $0 \le \theta \le \pi$

85. Solve $\sin 3x + \cos 2x = -2$

86. $\sin(3\theta + \alpha) + \sin(3\theta - \alpha) + \sin(\alpha - \theta) - \sin(\alpha + \theta) = \cos\alpha$

87. Solve $\sin 2x + \cos 4x = 2$.

88. Find all the solution of $4\cos^2 x \sin x - 2\sin^2 x = 3\sin x$

89. Solve the equation: $1 + 2\cos ecx = -\dfrac{\sec^2\left(\frac{x}{2}\right)}{2}$

90. Find all values of θ lying between 0 and 2π satisfying the equation $r\sin\theta = \sqrt{3}$ and $r + 4\sin\theta = 2(\sqrt{3} + 1)$

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91. Solve the following system of equations. $\sin x + \cos y = 1, \cos 2x - \cos 2y = 1$

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92. Find the coordinates of the points of intersection of the curves $y = \cos x, y = \sin 3x$ if $-\dfrac{\pi}{2} \leq x \leq \dfrac{\pi}{2}$

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93. Find the range of y such that the equation in x , $y + \cos x = \sin x$ has a real solutions . For $y = 1$, find x such that $0 < x < 2\pi$

94. A triangle ABC is such that $\sin(2A + B) = \dfrac{1}{2}$ and If A, B and C are in $A.\ P.$, then find the value of A and C

95. Find the values of θ in the interval $\left(-\dfrac{\pi}{2}, \dfrac{\pi}{2}\right)$ satisfying the equation $(1 - \tan\theta)(1 + \tan\theta)\sec^2\theta + 2^{\tan^2\theta} = 0$

96. Solve $\sin x \left(\cos\dfrac{x}{4} - 2\sin x\right) + \left(1 + \sin\dfrac{x}{4} - 2\cos x\right)\cos x = 0.$

97. Find all possible triplets (x,y,z) such that $(x + y) + (y + 2z)\cos 2\theta + (z - x)\sin^2 \theta = 0$, for all θ.

98. For every real number find all the real solutions to equation

$\sin x + \cos(a + x) + \cos(a - x) = 2$

99. Solve the equation $(\tan x)^{\cos^2 x} = (\cot x)^{\sin x}$

100. Solve the equation $a \cos x + \cot x + 1 = \operatorname{cosec}\ x$

101. Find the value of 'a' which the system of equation $\sin x \cdot \cos y = a^2$ and $\sin y \cdot \cos x = a$ have a solution

102. Find all the number 'a' for which any root of the equation $\sin 3x = a \sin x + (4 - 2|a|)\sin^2 x$ is a root of the equation $\sin 3x + \cos 2x = 1 + 2\sin x \cos 2x$ and any root of the latter equation is a root of the former .

103. Solve the inequality $\frac{5}{4}\sin^2 x + \sin^2 x \cdot \cos^2 x > \cos 2x$.

104. Solve the inequality . $\sin x \cos x + \frac{1}{2}\tan x \geq 1$

105. If $0 \le x \le 2\pi$, then $2^{\cos ec^2 x} \sqrt{\frac{1}{2}y^2 - y + 1} \le \sqrt{2}$

106. Solve the inequality $5 + 2\cos 2x \le 3|2\sin x - 1|$

107. Prove that the equation $2s \in x|x| + a$ has not solution for $a \in \left(\frac{3\sqrt{3} - \pi}{3} - \infty\right)$.

108. In $\triangle ABC$, prove that $\cosec\frac{A}{2} + \cosec\frac{B}{2} + \cosec\frac{C}{2} \ge 6$.

109. If $\dfrac{1}{\cos\alpha \cdot \cos\beta} + \tan\alpha \cdot \tan\beta = \tan\gamma$, where $0 < \gamma < \dfrac{\pi}{2}$ and α, β are positive acute angles , show that $\dfrac{\pi}{4} < \gamma < \dfrac{\pi}{2}$

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110. Find the quadrants of the coordinate planes such that for each point (x, y) on these quadrants (where $x \neq 0, y \neq 0$) , the equation, $\dfrac{\sin^4\theta}{x} + \dfrac{\cos^4\theta}{y} = \dfrac{1}{x+y}$ is soluble for θ .

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111. Let $\dfrac{b\cos x}{2\cos 2x - 1} = \dfrac{b + \sin x}{\left(\cos^2 x - 3\sin^2 x\right)\tan x}$, $b \in R.$

Equation has solutions if

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Examples Matching Type Questions

1. Find $\dfrac{dy}{dx}$ if $\tan 2x = \sin y$

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1. Find the solution of the equation $(\sin x + \cos x)\sin 2x = a(\sin^3 x + \cos^3 x)$ located between $\dfrac{\pi}{2}$ and π and for which values of 'a' does this equation have at most one solution satisfying the condition $\dfrac{\pi}{2} \leq x \leq \pi$.

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2. Solve $|\cos x - 2 \sin 2x - \cos 3x| = 1 - 2 \sin x - \cos 2x$.

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1. Solve $\sin 5x = \cos 2x$.

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2. Find the number of value of x in $[0, 5\pi]$ satisying the equation

$3\cos^2 x - 10\cos x + 7 = 0$

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3. If $2\tan^2 x - 5\sec x = 1$ for exactly seven distinct value of $x \in \left[0, \dfrac{n\pi}{2}\right]$, $n \in N$ then find the greatest value of n.

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4. Find the general solution of equation $\sec^2 x = \sqrt{2}(1 - \tan^2 x)$

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5. Solve $7\cos^2\theta + 3\sin^2\theta = 4$.

6. The general solution of equation $\tan^2\alpha + 2\sqrt{3}\tan\alpha = 1$

7. Find the number of solutions of $\sin^2 x - \sin x - 1 = 0 \in [-2\pi, 2\pi]$

8. The most general of θ satisfying $\tan\theta + \tan\left(\dfrac{3\pi}{4}\theta\right) = 2$ are given by

9. Find the general solution of $\sin x + \sin 5x = \sin 2x + \sin 4x$.

10. Solve $\cos \theta \cdot \cos 2\theta \cdot \cos 3\theta = \dfrac{1}{4}, 0 \le \theta \le \pi$

11. Solve $2 \cot 2x - 3 \cot 3x = \tan 2x$.

12. Find the roots of the equation $\cot x - \cos x = 1 - \cot x \cos x$

13. If the equation $x^2 + 4x\sin\theta + \tan\theta = 0$ $\left(0 < \theta < \dfrac{\pi}{2}\right)$ has repeated roots, then θ equals (i)$\dfrac{\pi}{12}$ (ii)$\dfrac{\pi}{6}$ (iii)$\dfrac{\pi}{12}$ or $\dfrac{5\pi}{12}$ (iv) $\dfrac{\pi}{6}$ or $\dfrac{\pi}{12}$

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14. Number of solutions of the equation $2\sin^3 x + 6\sin^2 x - \sin x - 3 = 0$ in $(0, 2\pi)$, are

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15. Find the number of roots of the equation $16\sec^3\theta - 12\tan^2\theta - 4\sec\theta = 9$ in interval $(-\pi, \pi)$

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Exercise For Session 2

1. Solve the equation $\sin x + \cos x = 1$

2. Solve $\sqrt{3}\cos\theta - 3\sin\theta = 4\sin 2\theta \cos 3\theta$.

3. Solve $\cot\theta + \mathrm{cosec}\theta = \sqrt{3}$

4. Solve $\sqrt{2}\sec\theta + \tan\theta = 1$.

5. Find the general solution of the equation

$$\left(\sqrt{3} - 1\right)\cos\theta + \left(\sqrt{3} + 1\right)\sin\theta = 2$$

6. Find the number of integral values of k for which the equation

$7\cos x + 5\sin x = 2k + 1$ has at least one solution.

7. Solve $2\sin^2 x - 5\sin x \cos x - 8\cos^2 x = -2.$

8. Solve the equation $(1 - \tan\theta)(1 + \sin 2\theta) = 1 + \tan\theta$

1. Find the general values of θ which satisfies the equation $\tan\theta = -1$ and $\cos\theta = \dfrac{1}{\sqrt{2}}$

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2. Find the general solution of $\operatorname{cosec}x = -2$ and $\cot x = \sqrt{3}$

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3. Find common roots of the equations $2\sin^2 x + \sin^2 2x = 2$ and $\sin 2x + \cos 2x = \tan x.$

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4. Solve the equation ,

$$\sqrt{3}\sin 2A = \sin 2B \text{ and } \sqrt{3}\sin^2 A + \sin^2 B = \frac{1}{2}(\sqrt{3} - 1).$$

5. Find the number of solutions of $\sin^2 x \cos^2 x = 1 + \cos^2 x + \sin^4 x$ in the interval $[0, \pi]$

6. Solve $1 + \sin x \dfrac{\sin^2 x}{2} = 0$

7. Solve $\cos^{50} x - \sin^{50} x = 1$

8. Find the number of real solution of the equation $(\cos x)^5 + (\sin x)^3 = 1$ in the interval $[0, 2\pi]$

9. Find the number of solution of the equation $1 + e^{\cot \wedge}(2x) = \sqrt{2|\sin x| - 1} + \dfrac{1 - \cos 2x}{1 + \sin^4 x} f$ or $x \in (0, 5\pi)$.

10. Find the number solution are ordered pair (x, y) of the equation $2^{\sec^2 x} + 2^{\csc^2 y} = 2\cos^2 x (1 - \cos^2 y)$ in $[0, 2\pi]$

Exercise For Session 4

1. If $2 \cos x < \sqrt{3}$ and $x \in [-\pi, \pi]$, then find the solution set for x.

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2. The set of all x in the interval $[0, \pi]$ for which $2 \sin^2 x - 3 \sin x + 1 \geq 0$ is_____

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3. If $\cos x - \sin x \geq 1$ and $0 \leq x \leq 2\pi$, then find the solution set for x.

▶ Watch Video Solution

4. Solve `sintheta+sqrt(3)costhetageq1,-pi

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5. Find the set of values of x , which satisfy

$$\sin x \cdot \cos^3 x > \cos \cdot \sin^3 x, 0 \le x \le 2\pi .$$

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6. The set of all $\xi n\left(\dfrac{-\pi}{2}, \dfrac{\pi}{2}\right)$ satisfying `|4sinx-1|

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7. Solve $\sin^4\left(\dfrac{x}{3}\right) + \cos^4\left(\dfrac{x}{3}\right) > \dfrac{1}{2}$

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8. Solve $\tan x - \tan^2 x > 0$ and $|2\sin x| < 1$.

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1. Show that $\dfrac{\sin x - \sin y}{\cos x + \cos y} = \tan\left(\dfrac{x-y}{2}\right)$

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2. Let the smallest positive value of x for which the function $f(x) = \sin\dfrac{x}{3} + \sin\dfrac{x}{11}, (x \in R)$ achieves its maximum value be x_0. Express x_0 in degree i.e. $x_0 = \alpha^0$. Then , the sum of the digits in α is

A. 15

B. 17

C. 16

D. 18

Answer: D

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3. The number of solutions of the equation $16\left(\sin^5 x + \cos^5 x\right) = 11(\sin x + \cos x)$ in the interval $[0, 2\pi]$ is

A. 6

B. 7

C. 8

D. 9

Answer: A

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4. If $x \sin a + y \sin 2a + z \sin 3a = \sin 4a$, $x \sin b + y \sin 2b + z \sin 3b = \sin 4b$, $x \sin c + y \sin 2c + z \sin 3c = \sin 4c$, then the roots of the equation $t^3 - \left(\dfrac{z}{2}\right)t^2 - \left(\dfrac{y+2}{4}\right)t + \left(\dfrac{z-x}{8}\right) = 0, a, b, c, \neq n\pi$, are (a) $\sin a, \sin b, \sin c$ (b) $\cos a, \cos b, \cos c$ (c) $\sin 2a, \sin 2b, \sin 2c$ (d) $\cos 2a, \cos 2b \cos 2c$

A. sin a , sin b , sin c

B. cos a, cos b , cos c

C. sin 2a , sin 2b , sin 2c

D. cos 2a , cos 2b , cos 2c

Answer: B

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5. Find the least positive value of x satisfying

$$\frac{\sin^2 2x + 4\sin^4 x - 4\sin^2 x \cos^2 x}{4 - \sin^2 2x - 4\sin^2 x} = \frac{1}{9}$$

A. (a) $\pi/3$

B. (b) $\pi/6$

C. (c) $2\pi/3$

D. (d) $5\pi/6$

Answer: B

6. The maximum value of the expression $\left|\sqrt{\sin^2 x + 2a^2} - \sqrt{2a^2 - 1 - \cos^2 x}\right|$, where a and x are real numbers, is $\sqrt{3}$ (b) $\sqrt{2}$ (c) 1 (d) $\sqrt{5}$

A. 1

B. 2

C. $\sqrt{2}$

D. $\sqrt{3}$

Answer: C

7. The general solution of $8\tan^2\dfrac{x}{2} = 1 + \sec x$ is

A. $x = 2n\pi \pm \cos^{-1}\left(\dfrac{-1}{3}\right)$

B. $x = 2n\pi \pm \dfrac{\pi}{6}$

C. $x = 2n\pi \pm \cos^{-1}\left(\dfrac{1}{3}\right)$

D. None of these

Answer: C

8. General solution of $\tan\theta + \tan 4\theta + \tan 7\theta = \tan\theta\tan 4\theta\tan 7\theta$ is

A. $\theta = \dfrac{n\pi}{4}$

B. $\theta = \dfrac{n\pi}{12}$

C. $\theta = \dfrac{n\pi}{12}$

D. None of these

Answer: B

9. Find the number of solution of the equation $e^{\sin x} - e^{-\sin x} - 4 = 0$

A. x=0

B. $x = \sin^{-1}\left[\log\left(2 - \sqrt{5}\right)\right]$

C. no real solution

D. None of the above

Answer: C

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10. Find the number of solution(s) of the equation

$\cos\left(\pi\sqrt{x}\right)\cos\left(\pi\sqrt{x - 4}\right) = 1.$

A. > 2

B. 2

C. 1

D. 0

Answer: C

11. The number of real solution of equation $\sin(e^x) = 5^x + 5^{-x}$ is :

A. 0

B. 1

C. 2

D. Infinitely many

Answer: A

12. about to only mathematics

A. $45°$, $60°$, $75°$

B. $30°$, $60°$, $90°$

C. $20°$, $60°$, $100°$

D. None of these

Answer: A

13. Let $2\sin^2 x + 3\sin x - 2 > 0$ and $x^2 - x - 2 < 0$ (x is measured in radian) . Then 'x' lies in the internal .

A. $\left(\dfrac{\pi}{6}, \dfrac{5\pi}{6}\right)$

B. $\left(-1, \dfrac{5\pi}{6}\right)$

C. $(-1, 2)$

D. $\left(\dfrac{\pi}{6}, 2\right)$

Answer: D

14. The number of points of intersection of two curves $y = 2\sin x$ and $y = 5x^2 + 2x + 3$ is 0 b. 1 c. 2 d. ∞

A. 0

B. 1

C. 2

D. ∞

Answer: A

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15. The number of all the possible triplets (a_1, a_2, a_3) such that $a_1 + a_2 \cos(2x) + a_3 \sin^2(x) = 0$ for all x is (a) 0 (b) 1 (c) 3 (d) infinite

A. 0

B. 1

C. 3

D. Infinite

Answer: D

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16. Find $\dfrac{dy}{dx}$ if $2x + 3y = \sin x$

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17. In the interval $\left[-\dfrac{\pi}{2}, \dfrac{\pi}{2} \right]$ the equation $\log_{\sin \theta}(\cos 2\theta) = 2$ has

A. no solution

B. a unique solution

C. two solution

D. infinitely many solution

Answer: B

---

18. If $\displaystyle\sum_{i=1}^{n} \cos\theta_i = n$, then the value of $\displaystyle\sum_{i=1}^{n} \sin\theta_i$.

A. n-1

B. O

C. n

D. n+1

Answer: B

---

19. If $(\sin\alpha)^x + (\cos\alpha)^x \geq 1, 0 < a < \dfrac{\pi}{2}$ then

A. $n \in [2, \infty)$

B. $(-\infty, 2]$

C. $n \in [-1, 1]$

D. None of these

Answer: B

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20. The most general values of 'x' for which $\sin x + \cos x = \min_{a \in R}\left[1, a^2 - 4a + 6\right]$ are given by

A. $2n\pi$

B. $2n\pi + \dfrac{\pi}{2}$

C. $n\pi + (-1)^n\dfrac{\pi}{4} - \dfrac{\pi}{4}$

D. None of these

Answer: C

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21. Find $\dfrac{dy}{dx}$ if $2x + 3y = \sin y$

22. If $\max\ \{5\sin\theta + 3\sin(\theta - \alpha)\} = 7$ then the set of possible vaues of

α is $\theta \in R$

A. $\left\{ x : x = 2n\pi \pm \dfrac{\pi}{3}, n \in I \right\}$

B. $\left\{ x : x = 2n\pi \pm \dfrac{2\pi}{3}, n \in I \right\}$

C. $\left[\dfrac{\pi}{3}, \dfrac{2\pi}{3} \right]$

D. None of these

Answer: A

23. Find the number of integral value of n so that $\sin x(\sin x + \cos x) = n$ has at least one solution.

A. 2

B. 1

C. 3

D. zero

Answer: A

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24. Find the number of solutions to $\sin\{x\} = \cos\{x\}$, where $\{\cdot\}$ denotes the fractional part, in $[0, 2\pi]$.

A. 5

B. 6

C. 7

D. None of these

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25. If $a, b \in [0, 2\pi]$ and the equation $x^2 + 4 + 3\sin(ax + b) - 2x = 0$ has at least one solution, then the value of $(a + b)$ can be $\dfrac{7\pi}{2}$ (b) $\dfrac{5\pi}{2}$ (c) $\dfrac{9\pi}{2}$ (d) none of these

A. $\dfrac{7\pi}{2}$

B. $\dfrac{3\pi}{2}$

C. $\dfrac{9\pi}{2}$

D. None of these

Answer: B

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26. The value of 'a' for which the equation $4\cos ec^2\pi(a+x)+a^2-4a=0$ has a real solution is

A. a=1

B. a=2

C. a=10

D. None of these

Answer: B

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27. If the equation $2\cos x+\cos 2\lambda x=3$ has only one solution , then λ is

A. 1

B. A rational number

C. An irrational number

D. None of these

Answer: C

---

28. Let n be a positive integer such that $\dfrac{\sin \pi}{2n} + \dfrac{\cos \pi}{2n} = \dfrac{\sqrt{n}}{2}$. Then

$6 \le n \le 8$ (b) `4

A. $6 \le n \le 8$

B. $4 < n \le 8$

C. $6 < n < 8$

D. $4 < n < 8$

Answer: D

---

29. The number of solution of the equation $5 \sec \theta - 13 = 12 \tan \theta$ in $[0, 2\pi]$ is

A. 2

B. 1

C. 4

D. 0

Answer: D

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30. The number of solutions of the equation $x^3 + x^2 + 4x + 2\sin x = 0$ in $0 \le x \le 2\pi$ is

A. Zero

B. One

C. Two

D. Four

Answer: B

31. If $\tan\left(\dfrac{\pi}{2}\sin\theta\right) = \cot\left(\dfrac{\pi}{2}\cos\theta\right)$, then $\sin\theta + \cos\theta$ is equal to

A. 0

B. 1

C. -1

D. 1 or -1

Answer: D

32. The equation $\sin x + \sin y + \sin z = -3$ for $0 \le x \le 2\pi$, $0 \le y \le 2\pi$, $o \le z \le 2\pi$, has

A. one solution

B. two sets of solutions

C. four sets of solutions

D. no solutions

Answer: A

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33. If $x = n\pi + (-1)^n \alpha, n \in I$ and $x = n\pi + (-1)^n \beta$ are the roots of $4\cos x - 3\sec x = \tan x$, then $4(\sin \alpha + \sin \beta)$ is

A. -1

B. 1

C. 2

D. None of these

Answer: A

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34. If $\tan m\theta = \tan n\theta$ and general value of θ are in AP, then common difference is

A. $\dfrac{1}{m-n}$

B. $\dfrac{\pi}{m+n}$

C. $\dfrac{\pi}{m-n}$

D. None of these

Answer: C

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35. If $\sin 3\alpha = 4\sin\alpha\sin(x+\alpha)\sin(x-\alpha)$, then

A. $x = n\pi \pm \dfrac{\pi}{3}, n \in I$

B. $x = n\pi \pm \dfrac{\pi}{6}, n \in I$

C. $x = n\pi \pm \dfrac{\pi}{2}, n \in I$

D. None of the above

Answer: A

36. $\lambda \cos x - 3 \sin x = \lambda + 1$ is solvabel for which value of λ .

A. $\lambda \in [0, 5]$

B. $\lambda \in [4, 5]$

C. lambda in (-oo,4]`

D. None of these

Answer: C

37. $\cos 2x - 3 \cos x + 1 = \dfrac{1}{(\cot 2x - \cot x)\sin(x - \pi)}$ holds , if

A. (a) cos x =0

B. (b) cos x =1

C. (c) $\cos x = \dfrac{5}{2}$

D. (d) for no value of x

Answer: A

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38. If $\sec x \cos 5x = -1$ and $0 < x < \dfrac{\pi}{4}$, then x is equal to

A. $\dfrac{\pi}{6}$

B. $\dfrac{\pi}{3}$

C. $\dfrac{\pi}{4}$

D. None of these

Answer: A

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39. If $\sin^{100}\theta - \cos^{100}\theta = 1$, then θ is

A. $2n\pi + \dfrac{\pi}{3}, n \in I$

B. $n\pi + \dfrac{\pi}{2}, n \in I$

C. $n\pi + \dfrac{\pi}{4}, n \in I$

D. $2n\pi - \dfrac{\pi}{3}, n \in I$

Answer: B

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40. If $\sqrt{3}\sin x - \cos x = \min_{\alpha \in R}\{2, e^2, \pi, \alpha^2 - 4\alpha + 7\}$, then

A. (a)$x = 2n\pi, n \in I$

B. (b)$x = 2n\pi + \dfrac{2\pi}{3}, n \in I$

C. (c)$x = n\pi + (-1)^n\dfrac{\pi}{4} + \dfrac{\pi}{6}, n \in I$

D. (d)$x = n\pi + (-1)^n\dfrac{\pi}{4} - \dfrac{\pi}{3}, n \in I$

Answer: B

41. The number of solutions of the equation $\cos 4x + 6 = 7 \cos 2x$, when

$x \in [315°, 317°]$ is

A. 0

B. 1

C. 2

D. 4

Answer: A

42. The number of solutions of

$\cot(5\pi \sin \theta) = \tan(5\pi \cos \theta), \forall \theta \in (0, 2\pi)$ is

A. 7

B. 14

C. 21

D. 28

Answer: B

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43. If $\exp\left[\left(\sin^2 x + \sin^4 x + \sin^6 x + \,....\,\infty\right)\,\text{In}2\right]$ satisfies the equation $y^2 - 9y + 8 = 0$, then the value of $\dfrac{\cos x}{\cos x + \sin x}, 0 < x < \dfrac{\pi}{2},$

is

A. $\sqrt{3} + 1$

B. $\dfrac{\sqrt{3} - 1}{2}$

C. $\sqrt{3} - 1$

D. None of these

Answer: B

44. The total number of solutions of $\cos x = \sqrt{1 - \sin 2x}$ in $[0, 2\pi]$ is equal to

A. 2

B. 3

C. 5

D. None of these

Answer: A

45. Solve : $\cos 3x \cdot \cos^3 x + \sin 3x \cdot \sin^3 x = 0$

A. $(2n + 1)\dfrac{\pi}{4}$

B. $(2n - 1)\dfrac{\pi}{4}$

C. $\dfrac{n\pi}{4}$

D. None of these

Answer: A

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46. Total number of solutions of $\sin x = \dfrac{|x|}{10}$ is equal to

A. 4

B. 6

C. 7

D. None of these

Answer: B

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47. The number of all possible 5-tuples $(a_1, a_2, a_3, a_4, a_5)$ such that $a_1 + a_2 \sin x + a_3 \cos x + a_4 \sin 2x + a_5 \cos 2x = 0$ hold for all x is

A. zero

B. 1

C. 2

D. infinite

Answer: B

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48. x_1 and x_2 are two positive value of x for which $2 \cos x$, $|\cos x|$ and $3 \sin^2 x - 2$ are in GP. The minimum value of $|x_1 - x_2|$ is equal to

A. $\dfrac{4\pi}{3}$

B. $\dfrac{\pi}{6}$

C. $2\cos^{-1}\left(\dfrac{2}{3}\right)$

D. $\cos^{-1}\left(\dfrac{2}{3}\right)$

Answer: C

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49. If $\cos x - \dfrac{\cot \beta \sin x}{2} = \dfrac{\sqrt{3}}{2}$, then the value of $\tan \dfrac{x}{2}$ is

A. $\tan \dfrac{\beta}{2} \tan 15°$

B. $\tan \dfrac{\beta}{2}$

C. $\tan 15°$

D. None of these

A. $\tan \dfrac{\beta}{2} \tan 15°$

B. $\tan \dfrac{\beta}{2}$

C. $\tan 15°$

D. None of the above

Answer: A

50. The expression $n \sin^2 \theta + 2n \cos(\theta + \alpha) \sin \alpha \sin \theta + \cos 2(\alpha + \theta)$ is independent of θ, the value of n is

A. 1

B. 2

C. 3

D. 4

Answer: B

51. The value of the determinants $\begin{vmatrix} 1 & a & a^2 \\ \cos(n-1)x & \cos nx & \cos(n+1)x \\ \sin(n-1)x & \sin nx & \sin(n+1)x \end{vmatrix}$ is

zero if

A. $x = n\pi$

B. $x = n\pi/2$

C. $x = (2n+1)\pi/2$

D. $x = \dfrac{1+a^2}{2a} - n \in I$

Answer: A

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52. If $\dfrac{\sin(3\alpha)}{\cos(2\alpha)} < 0$ If α lies in

A. $(13\pi/48, \, 14\pi/48)$

B. $(14\pi/48, \, 18\pi/48)$

C. $(18\pi/48, 23\pi/48)$

D. any of these intervals

A. $(13\pi/48, 14\pi/48)$

B. $(14\pi/48, 18\pi/48)$

C. $(18\pi/48, 23\pi/48)$

D. any of these intervals

Answer: A

53. If $f(x) = \begin{vmatrix} \sin^2\theta & \cos^2\theta & x \\ \cos^2\theta & x & \sin^2\theta \\ x & \sin^2\theta & \cos^2\theta \end{vmatrix}\theta \in (0, \pi/2),$ then roots of f(x)=0 are

A. 1/2,-1

B. 1/2,-1,0

C. $-1/2, 1, 0$

D. $-1/2, -1, 0$

Answer: A

---

54. The equation $\sin x + \sin y + \sin z = -3$ for $0 \le x \le 2\pi,$ $0 \le y \le 2\pi, o \le z \le 2\pi,$ has

A. one solution

B. two sets of solutions

C. four sets of solutions

D. no solutions

Answer: A

55. If $\sec x \cos 5x + 1 = 0$, where $0 < x < 2\pi$, then x=

A. $\dfrac{\pi}{5}, \dfrac{\pi}{4}$

B. $\dfrac{\pi}{5}$

C. $\dfrac{\pi}{4}$

D. None of these

Answer: C

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56. If $|k| = 5$ and $0° \leq \theta \leq 360°$, then the number of different solution of $3 \cos \theta + 4 \sin \theta = k$ is

A. Zero

B. Two

C. One

D. Infinite

Answer: B

57. If $\cot(\alpha + \beta = 0,$ then $\sin(\alpha + 2\beta$ can be $-\sin\alpha$ (b) $\sin\beta$ (c) $\cos\alpha$ (d) $\cos\beta$

A. $\cos\beta$

B. $\cos\alpha$

C. $\sin\beta$

D. $\cos 2\beta$

Answer: A

58. If : $\cot \theta + \cot \left(\dfrac{\pi}{4} + \theta \right) = 2$, then : $\theta =$

A. $2n\pi \pm \dfrac{\pi}{6}$

B. $2n\pi \pm \dfrac{\pi}{3}$

C. $n\pi \pm \dfrac{\pi}{3}$

D. $n\pi \pm \dfrac{\pi}{6}$

Answer: D

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59. If $\cos 2\theta = (\sqrt{2} + 1) \left(\cos \theta - \dfrac{1}{\sqrt{2}} \right)$, then the value of θ is

A. $2n\pi + \dfrac{\pi}{4}$

B. $2n\pi \pm \dfrac{\pi}{4}$

C. $2n\pi - \dfrac{\pi}{4}$

D. None of these

Answer: B

60. If $\left| 1 - \dfrac{|\sin x|}{1 + \sin x} \right| \geq \dfrac{2}{3}$, then sin x lies in

A. $\left(-\infty, \dfrac{-1}{2} \right] \cup \left[\dfrac{1}{2}, \infty \right)$

B. $\left(-\dfrac{1}{2}, \dfrac{1}{2} \right)$

C. $\left[-1, \dfrac{-5}{8} \right] \cup \left[-\dfrac{1}{4}, \dfrac{1}{2} \right]$

D. None of the above

Answer: C

Exercise More Than One Correct Option Type Questions

1. Find the value of t which satisfies $(t - [|\sin x|])! = 3!5!7!$ $where[.]$ denotes the greatest integer function.

A. 9

B. 10

C. 11

D. 12

Answer: B::C

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2.   Let

$f(x) = \cos(a_1 + x) + \frac{1}{2}\cos(a_2 + x) + \frac{1}{2^2}\cos(a_1 + x) + + \frac{1}{2^{n-1}}\cos(a_n$

where $a)1, a_2 a_n \in R$. If $f(x_1) = f(x_2) = 0, then |x_2 - x_1|$ may be equal

to π (b) 2π (c) 3π (d) $\frac{\pi}{2}$

A. π

B. 2π

C. 3π

D. $\dfrac{\pi}{2}$

Answer: A::B::C

3. Let α, β, γ parametric angles of 3 points P,Q and R respectively lying on $x^2 + y^2 = 1$. If the length of chords AP, PQ and AR are in GP where A is (-1,0), then $[Given,\ \alpha,\ \beta,\ \gamma \in (0, 2\pi)]$.

A. $\sin \dfrac{\alpha + \gamma}{4} \cos \dfrac{\alpha - \gamma}{4} \geq \sin \dfrac{\beta}{2}$

B. $\sin \left(\dfrac{\alpha + \gamma}{4} \right) \cos \left(\dfrac{\alpha - \gamma}{4} \right) \leq \dfrac{\sin(\beta)}{2}$

C. $\sin \dfrac{\alpha}{2} \sin \dfrac{\gamma}{2} \geq \sin \dfrac{\beta}{2}$

D. $\sin \dfrac{\alpha}{2} \sin \dfrac{\gamma}{2} \leq \sin \dfrac{\beta}{2}$

Answer: A::D

4. Let x, y, z be elements from interval $[0, 2\pi]$ satisfying the inequality

$(4 + \sin 4x)(2 + \cot^2 y)(1 + \sin^4 z) \leq 12 \sin^2 z$, then

    A. the number of ordered pairs (x,y) is 5

    B. the number of ordered pairs (y,z) is 8

    C. the number of ordered pairs (z,x) is 8

    D. the number of pairs (y,z) such that z=y is 2

Answer: C::D

5. The number of integral values of a for which the system of linear

equations $\quad\quad\quad\quad\quad\quad\quad\quad\quad x \sin \theta - 2y \cos \theta - az = 0,$

$x + 2y + z = 0, \ -x + y + z = 0$ may have non-trivial solutions, then

A. The given system will have infinite solutions for a=2

B. The number of integer values of a is 3 for the system to have

nontrivial solutions.

C. For a=1 there exists θ for which the system will have infinite

solutions

D. For a=3 there exists θ for which the system will have unique

solutions

Answer: B::C::D

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6. The equation $2\sin^3\theta + (2\lambda - 3)\sin^2\theta - (3\lambda + 2)\sin\theta - 2\lambda = 0$

A. 0

B. $\dfrac{1}{2}$

C. 1

D. -1

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7. If $x + y = 2\pi/3$ and $\sin x / \sin y = 2$, then the

    A. number of value of $x \in [0, 4\pi]$ are 4

    B. number of value of $x \in [0, 4\pi]$ are 2

    C. number of value of $y \in [0, 4\pi]$ are 2

    D. number of value of $y \in [0, 4\pi]$ are 8

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8. If $0 < x < 2\pi$ and $|\cos x| \le \sin x$, then

A. the set of all values of x is $\left[\dfrac{\pi}{4}, \dfrac{3\pi}{4}\right]$

B. the number of solutions that are integral multiple of $\dfrac{\pi}{4}$ is four

C. the sum of the largest and the smallest solution is π

D. the set of all value of x is $x \in \left[\dfrac{\pi}{2}, \dfrac{\pi}{2}\right) \cup \left(\dfrac{\pi}{2}, \dfrac{3\pi}{4}\right]$

Answer: A::C

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9. If x and y are positive acute angles such that $(x + y)$ and $(x - y)$ satisfy the equation $\tan^2 \theta - 4\tan \theta + 1 = 0$, then $x = \dfrac{\pi}{6}$ (b) $y = \dfrac{\pi}{4}$

(c) $y = \dfrac{\pi}{6}$ (d) $y = \dfrac{\pi}{4}$

A. $x = \dfrac{\pi}{6}$

B. $y = \dfrac{\pi}{4}$

C. $y = \dfrac{\pi}{6}$

D. $x = \dfrac{\pi}{4}$

Answer: C::D

10. If $x + y = \dfrac{4\pi}{3}$ and $\sin x = 2\sin y$, then

A. (a)$x = n\pi + \dfrac{\pi}{2}, n \in I$

B. (b)$y = \dfrac{5\pi}{6} - n\pi, n \in I$

C. (c)Both (a) and (b)

D. (d)None of the above

Answer: C

11. The number of solutions of the equations $y = \dfrac{1}{3}[\sin\theta + [\sin\theta + [\sin\theta]]]$ and $[y + [y]] = 2\cos\theta$ [where , [.] denote the greatest integer function] is/are

A. 0

B. 1

C. 2

D. infinte

Answer: A

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12. If $[\sin x] + [\sqrt{2}\cos x] = -3, x \in [0, 2\pi]$, (where ,[.] denotes th

greatest integer function), then

A. $x \in \left(\pi, \dfrac{5\pi}{4}\right)$

B. $x \in \left(\pi, \dfrac{7\pi}{6}\right)$

C. $x \in \left[\pi, \dfrac{5\pi}{4}\right]$

D. None of these

Answer: A

13. If $\alpha \in [-2\pi, 2\pi]$ and $\cos. \dfrac{\alpha}{2} + \sin. \dfrac{\alpha}{2} = \sqrt{2}(\cos 36° - \sin 18°)$,

then a value of α

A. $\dfrac{7\pi}{6}$

B. $\dfrac{\pi}{6}$

C. $-\dfrac{5\pi}{6}$

D. $-\dfrac{\pi}{6}$

Answer: A::D

14. The number of value of α in the interval $[-\pi, 0]$ satisfying

$\sin \alpha + \displaystyle\int_{\alpha}^{2\alpha} \cos 2x\, dx = 0$, then

A. $\alpha = 0$

B. $\alpha = 0, \ -\pi, \ -\dfrac{\pi}{3}$

C. $\alpha = \dfrac{\pi}{6}, \dfrac{5\pi}{6}$

D. None of the above

Answer: A::B

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15. Find the number of solution of $\theta \in [0, 2\pi]$ satisfying the equation

$$\left((\log)_{\sqrt{3}} \tan \theta \left(\sqrt{(\log)_{\tan \theta} 3 + (\log)_{\sqrt{3}} 3\sqrt{3}} \right) = -1$$

A. $\theta = \dfrac{\pi}{6}$

B. $\dfrac{\pi}{3}, \dfrac{5\pi}{3}$

C. has sum $\dfrac{4\pi}{3}$

D. > 2

Answer: A::C

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16. If α and β are the solution of $a\cos\theta + b\sin\theta = c$, then

A. $\sin\alpha + \sin\beta = \dfrac{2bc}{a^2 + b^2}$

B. $\sin\alpha + \sin\beta = \dfrac{c^2 - a^2}{a^2 + b^2}$

C. $\sin\alpha + \sin\beta = \dfrac{2ac}{b^2 + c^2}$

D. $\sin\alpha + \sin\beta = \dfrac{c}{a^2 + b^2}$

Answer: A::B

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17. The solution of the equation $\sin 2x + \sin 4x = 2\sin 3x$ is

A. $x = \dfrac{n\pi}{3}$

B. $x = n\pi$

C. $x = 2n\pi$

D. None of the above

Answer: A::C

---

18. One of the general solutions of $4\sin^4 x + \cos^4 x = 1$ is

A. $(2n + 1)\dfrac{\pi}{2}$

B. $n\pi$

C. $n\pi \pm \sin^{-1}\sqrt{\dfrac{2}{5}}$

D. None of these

Answer: B::C

---

19. The value of x , $0 \le x \le \dfrac{\pi}{2}$ which satisfy the equation $81^{\sin^2 x} + 81^{\cos^2 x} = 30$ are

A. $\dfrac{\pi}{3}$

B. $\dfrac{\pi}{4}$

C. $\dfrac{\pi}{6}$

D. $\dfrac{7\pi}{18}$

Answer: A::C

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20. The value of x in $\left(0, \dfrac{\pi}{2}\right)$ satisfying $\dfrac{\sqrt{3}-1}{\sin x} + \dfrac{\sqrt{3}+1}{\cos x} = 4\sqrt{2}\,is\,/\,are$ $\dfrac{\pi}{12}$ (b) $\dfrac{5\pi}{12}$ (c) $\dfrac{7\pi}{24}$ (d) $\dfrac{11\pi}{36}$

A. $\dfrac{\pi}{15}$

B. $\dfrac{\pi}{12}$

C. $\dfrac{11\pi}{36}$

D. $\dfrac{3\pi}{10}$

Answer: B::C

21. The values of α for which the equation $\dfrac{\alpha^2}{1 - \tan^2 x} = \dfrac{\sin^2 + x\alpha^2 - 2}{\cos 2x}$ has solution can be

A. $\alpha \leq -1$

B. $\alpha \geq 1$

C. $\alpha = 1/2$

D. α in any real number

Answer: A::B

22. For which values of a does the equation $4\sin\left(x + \dfrac{\pi}{3}\right)\cos\left(x - \dfrac{\pi}{6}\right) = a^2 + \sqrt{3}\sin 2x - \cos 2x$ have solution? Find the solution for a-0.

A. -2

B. 0

C. 2

D. $a, a \in \,] - 2, 2[$

Answer: A::B::C::D

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23. Which of the following is/are correct?

A. $(\tan x)^{In(\sin x)} > (\cot x)^{In \sin x}, \ \forall x \in (0, \pi/4)$

B. $4^{Incosecx} < 5^{Incosecx}, \ \forall x \in (0, \pi/2)$

C. $(1/2)^{In(\cos x)} < (1/3)^{In(\cos x)}, \ \forall x \in (0, \pi/2)$

D. $2^{In(\tan x)} > 2^{In(\tan x)}, \ \forall x \in (0, \pi/2)$

Answer: A::B::C::D

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24. If $\begin{vmatrix} 1 + \cos^2\theta & \sin^2\theta & 4\cos 6\theta \\ \cos^2\theta & 1 + \sin^2\theta & 4\cos 6\theta \\ \cos^2\theta & \sin^2\theta & 1 + 4\cos 6\theta \end{vmatrix} = 0$, and $\theta \in \left(0, \dfrac{\pi}{3}\right)$, then

value of θ is

A. $\dfrac{11\pi}{24}$

B. $\dfrac{7\pi}{24}$

C. $\dfrac{5\pi}{24}$

D. None of these

Answer: A::B

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25. If [x] dnote the greatest integer less than or equal to x then the

equation $\sin x = [1 + \sin x] + [1 - \cos x]$ [has no solution in

A. $\left[-\dfrac{\pi}{2}, \dfrac{\pi}{2} \right]$

B. $\left[\dfrac{\pi}{2}, \pi\right]$

C. $\left[\pi, \dfrac{3\pi}{2}\right]$

D. R

Answer: A::B::C::D

Exercise Passage Based Questions

1. If number of solution and sum of solution of the equation $3\sin^2 x - 7\sin x + 2 = 0$, $x \in [0, 2\pi]$ are respectively N and S and $f_n(\theta) = \sin^n \theta + \cos^n \theta$. On the basis of above information , answer the following questions.

Value of N is

A. 1

B. 2

C. 3

D. 4

Answer: B

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2. If number of solution and sum of solution of the equation $3 \sin^2 x - 7 \sin x + 2 = 0$, $x \in [0, 2\pi]$ are respectively N and S and $f_n(\theta) = \sin^n \theta + \cos^n \theta$. On the basis of above information, answer the following questions.

Value of S is

A. $\dfrac{5\pi}{6}$

B. $\dfrac{7\pi}{6}$

C. 2π

D. π

Answer: D

3. If number of solution and sum of solution of the equation $3\sin^2 x - 7\sin x + 2 = 0$, $x \in [0, 2\pi]$ are respectively N and S and $f_n(\theta) = \sin^n \theta + \cos^n \theta$. On the basis of above information, answer the following questions.

If α is solution of equation $3\sin^2 x - 7\sin x + 2 = 0$, $x \in [0, 2\pi]$, then the value of $f_4(\alpha)$ is

A. $\dfrac{97}{81}$

B. $\dfrac{57}{81}$

C. $\dfrac{65}{81}$

D. 0

Answer: C

4. Let $\log_a N = \alpha + \beta$ where α is integer and $\beta = [0, 1)$. Then , On the basis of above information , answer the following questions.

The difference of largest and smallest integral value of N satisfying $\alpha = 3$ and $a = 5$, is

A. 499

B. 500

C. 501

D. 502

Answer: A

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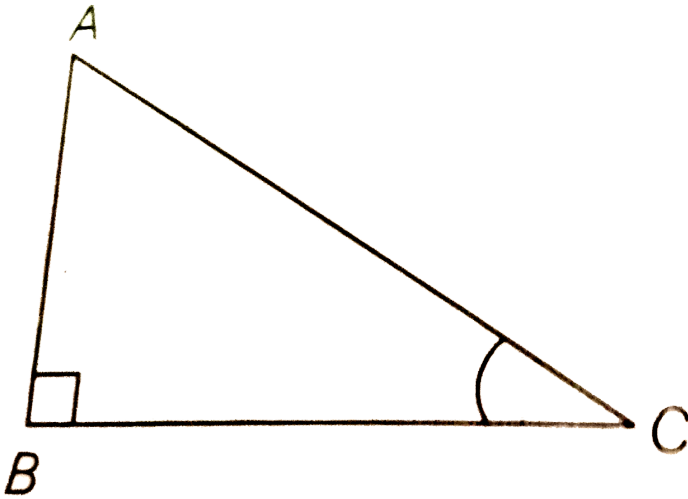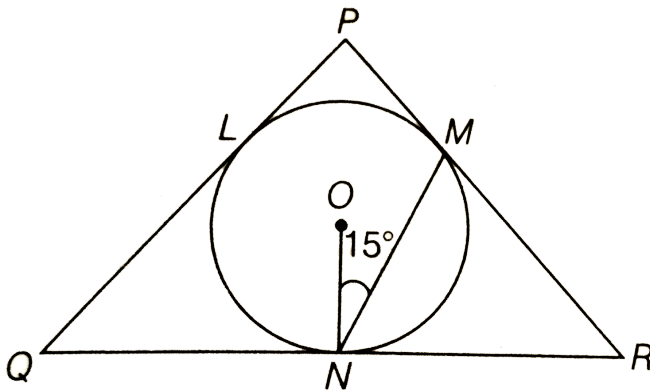**5.** Find the minimum or maximum value of the function if $f(x) = 9x^2 + 12x + 2$

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6. If an angle and a side of a right angle triangle is known , then rest of the sides and angles can be found as follows

In $\triangle ABC$(figure), if $\angle B = 90°$, $\angle C = \theta$ and $BC = x$, then

$AB = x \tan \theta$ and $AC = x \sec \theta$.

Now, consider in isosceles triangle PQR (Figure 2),

Where PQ=PR and $20N = \sqrt{3}$

On the basis of the above information answer the question

The angle of triangle PQR are

A. $150°$, $15°$, $15°$

B. $60°$, $60°$, $60°$

C. $120°$, $30°$, $30°$
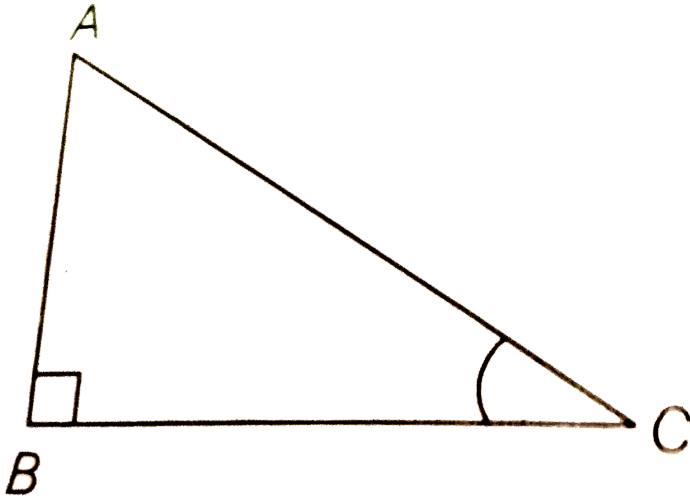
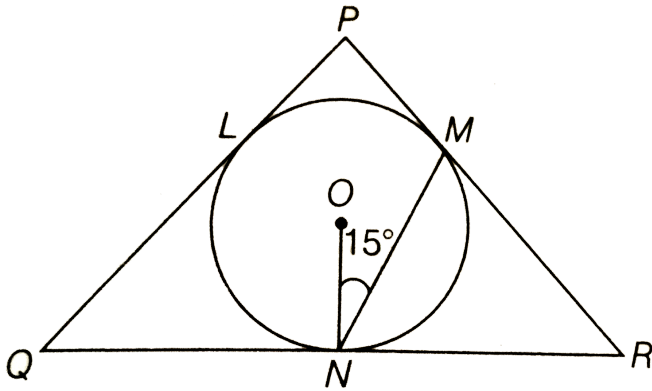D. $75°$, $52.5°$, $52.5°$

Answer: C

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7. If an angle and a side of a right angle triangle is known , then rest of

the sides and angles can be found as follows

In $\triangle ABC$(figure), if $\angle B = 90°$, $\angle C = \theta$ and $BC = x$, then

$AB = x \tan \theta$ and $AC = x \sec \theta$.

Now, consider in isosceles triangle PQR (Figure 2),

Where PQ=PR and $20N = \sqrt{3}$

On the basis of the above information answer the question

The angle of triangle PQR are

A. $\tan 15°$

B. $\sqrt{3}\tan 15°$

C. $\cot 15^\circ$

D. $\sqrt{3}\cot 15^\circ$

Answer: D

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8. α is a root of equation $(2\sin x - \cos x)(1 + \cos x) = \sin^2 x$, β is a root of the equation $3\cos 2x - 10\cos x + 3 = 0$ and γ is a root of the equation $1 - \sin 2x = \cos x - \sin x : 0 \le \alpha, \beta, \gamma, \le \pi/2$

$\cos \alpha + \cos \beta + \cos \gamma$ can be equal to

A. $\dfrac{3\sqrt{6} + 2\sqrt{2} + 6}{6\sqrt{2}}$

B. $\dfrac{3\sqrt{3} - 8}{6}$

C. $\dfrac{3\sqrt{3} + 2}{6}$

D. None of these

Answer: A

▶

9. α is a root of equation $(2\sin x - \cos x)(1 + \cos x) = \sin^2 x$, β is a root of the equation $3\cos^2 x - 10\cos x + 3 = 0$ and γ is a root of the equation $1 - \sin 2x = \cos x - \sin x : 0 \le \alpha, \beta, \gamma, \le \pi/2$

$\sin\alpha + \sin\beta + \sin\gamma$ can be equal to

A. $\dfrac{14 - 3\sqrt{2}}{6\sqrt{2}}$

B. $5/6$

C. $\dfrac{3 + 4\sqrt{2}}{6}$

D. $\dfrac{1 + \sqrt{2}}{2}$

Answer: C

10. Find $\dfrac{dy}{dx}$ if $y = 2\sin x - \cos x$

11. Consider the equation $5 \sin^2 x + 3 \sin x \cos x - 3 \cos^2 x = 2$............ (i)

$\sin^2 x - \cos 2x = 2 - \sin 2x$............ (ii)

If α is a root (i) and β is a root of (ii), then $\tan \alpha + \tan \beta$ can be equal to

A. $\left(1 + \sqrt{69}/6\right.$

B. $-1 - \sqrt{69}/6$

C. $\dfrac{-3 + \sqrt{69}}{6}$

D. $\dfrac{3 - \sqrt{69}}{3}$

Answer: A

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12. Consider the equation $5 \sin^2 x + 3 \sin x \cos x - 3 \cos^2 x = 2$............ (i)

$\sin^2 x - \cos 2x = 2 - \sin 2x$............ (ii)

If $\tan \alpha, \tan \beta$ satisfy (i) and $\cos \gamma, \cos \delta$ satisfy (ii) , then

$\tan \alpha \cdot \tan \beta + \cos \gamma + \cos \delta$ can be equal to

A. a) -1

B. b) $-\dfrac{5}{3} + \dfrac{2}{\sqrt{13}}$

C. c) $\dfrac{5}{3} - \dfrac{2}{\sqrt{13}}$

D. d) $\dfrac{5}{3} + \dfrac{2}{\sqrt{13}}$

Answer: B

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13. Consider the equation $5\sin^2 x + 3\sin x \cos x - 3\cos^2 x = 2$............. (i)

$\sin^2 x - \cos 2x = 2 - \sin 2x$............ (ii)

The number of solutions common to (i) and (ii) is 0 1 finite infinite

A. 0

B. 1

C. finite

D. infinite

Answer: A

Exercise Single Integer Answer Type Questions

1. If the sum of the root of the equation $\cos 4x + 6 + 7\cos 2x$ in the interval [0,314] is $k\pi$, $k \in R$ Find (k-1248)

2. Find $\dfrac{dy}{dx}$ if $ax + by^2 = \cos y$

3. Number of ordered pair (x,y) which satisfies the relation $\dfrac{x^4 + 1}{8x^2} = \sin^2 y \cdot \cos^2 y$, where $y \in [0, 2\pi]$

4. Find $\dfrac{dy}{dx}$ if $\sin(x - y) = 3x$

5. If $\cos A \sin\left(A - \dfrac{\pi}{6}\right)$ is maximum , when the value of A is equal to $\dfrac{\pi}{\lambda}$, then the value of λ is

6. Let $p, q \in N$ and $q > p$, the number of solutions of the equation $q|\sin\theta| = p|\cos\theta|$ in the interval $[0, 2\pi]$ is

7. If $\theta_1, \theta_2, \theta_3$ are three values lying in $[0, 3\pi)$ for which $\tan\theta = \lambda$, then the   value   of

$$\left| \tan\left(\frac{\theta_1}{3}\right)\tan\left(\frac{\theta_2}{3}\right) + \tan\left(\frac{\theta_2}{3}\right)\tan\left(\frac{\theta_2}{3}\right) + \tan\left(\frac{\theta_3}{3}\right)\tan\left(\frac{\theta_1}{3}\right) \right|$$ is

8. If α be the smallest positive root of the equation $\sqrt{\sin(1-x)} = \sqrt{\cos x}$, then the approximate integeral value of α must be .

9. If x and y are the real numbers satisfying the equation $12\sin x + 5\cos x = 2y^2 - 8y + 21$, then the value of $12\cot\left(\frac{xy}{2}\right)$ is:

10. If $\tan(\pi\cos\theta) = \cot(\pi\sin\theta)$,then $\cos^2(\theta - \pi/4)$ is equal to

11. If $3\sin x + 4\cos x = 5,$ then the value of $90\tan^2\left(\dfrac{x}{2}\right) - 60\tan\left(\dfrac{x}{2}\right) + 10$ is equal to

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Exercise Statement I And Ii Type Questions

1. Statement I $\sin x = a,$ where $-1 < a < 0,$ then for $x \in [0, n\pi]$ has $2(n-1)$ solution $\forall n \in N$.

Statement II sin x takes value a exactly two times when we take one complete rotation covering all the quadrants starting from x=0 .

A. Statement I is true , Statement II is true , Statement II is a correct explanation for Statement I.

B. Statement I is true , Statement II is true , Statement II is not a correct explanation for Statement II.

C. Statement I is true , Statement II is false

D. Statement I is false , Statement II true .

Answer: d

2. Statement I The number of solution of the equation $|\sin x| = |x|$ is only one.

Statement II $|\sin x| \geq 0 \forall x \in R$.

A. Statement I is true , Statement II is true , Statement II is a correct explanation for Statement I.

B. Statement I is true , Statement II is true , Statement II is not a correct explanation for Statement II.

C. Statement I is true , Statement II is false

D. Statement I is false , Statement II true .

Answer: B

3. Statement -1: If $2\sin 2x - \cos 2x = 1, x \neq (2n+1)\dfrac{\pi}{2}, n \in Z$, then $\sin 2x + \cos 2x = 5$

Statement-2: $\sin 2x + \cos 2x = \dfrac{1 + 2\tan x - \tan^2 x}{1 + \tan^2 x}$

A. A. Statement I is true , Statement II is true , Statement II is a correct explanation for Statement I.

B. B. Statement I is true , Statement II is true , Statement II is not a correct explanation for Statement II.

C. C. Statement I is true , Statement II is false

D. D. Statement I is false , Statement II true .

Answer: D

4. Statement I The system of linear equations

$$x + (\sin \alpha)y + (\cos \alpha)z = 0$$

$$x + (\cos \alpha)y + (\sin \alpha)z = 0$$

$$-x + (\sin \alpha)y - (\cos \alpha)z = 0$$

has a not trivial solution for only one value of α lying between 0 and π.

Statement II $\begin{vmatrix} \sin x & \cos x & \cos x \\ \cos x & \sin x & \cos x \\ \cos x & \cos x & \sin x \end{vmatrix} = 0$

has no solution in the interval $-\pi/4 < x < \pi/4$.

A. Statement I is true , Statement II is true , Statement II is a correct

explanation for Statement I.

B. Statement I is true , Statement II is true , Statement II is not a

correct explanation for Statement II.

C. Statement I is true , Statement II is false

D. Statement I is false , Statement II true .

Answer: B

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5. Let $\theta \in (\pi/4, \pi/2)$, then

Statement I $(\cos\theta)^{\sin\theta} < (\cos\theta)^{\cos\theta} < (\sin\theta)^{\cos\theta}$

Statement II The equation $e^{\sin\theta} - e^{-\sin\theta} = 4$ ha a unique solution.

A. (a)Statement I is true , Statement II is true , Statement II is a correct

explanation for Statement I.

B. (b)Statement I is true , Statement II is true , Statement II is not a

correct explanation for Statement II.

C. (c)Statement I is true , Statement II is false

D. (d)Statement I is false , Statement II true .

Answer: C

6. If $\exp\left[\left(\sin^2 x + \sin^4 x + \sin^6 x + \ldots \infty\right) \ln 2\right]$ satisfies the equation $y^2 - 9y + 8 = 0$, then the value of $\dfrac{\cos x}{\cos x + \sin x}, 0 < x < \dfrac{\pi}{2}$, is

A. Statement I is true , Statement II is true , Statement II is a correct

explanation for Statement I.

B. Statement I is true , Statement II is true , Statement II is not a

correct explanation for Statement II.

C. Statement I is true , Statement II is false

D. Statement I is false , Statement II true .

Answer: C

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Exercise Matching Type Questions

	Column I		Column II
(A)	If α, β are the solutions of $\sin x = -\dfrac{1}{2}$ in $[0,2\pi]$ and α, γ are the solutions of $\cos x = \dfrac{-\sqrt{3}}{2}$ in $[0,2\pi]$, then	(p)	$\alpha - \beta = \pi$
(B)	If α, β are the solutions of $\cot x = -\sqrt{3}$ in $[0,2\pi]$ and α, γ are the solutions of $\csc x = -2$ in $[0,2\pi]$, then	(q)	$\beta - \gamma = \pi$
(C)	If α, β are the solutions of $\sin x = -\dfrac{1}{2}$ in $[0,2\pi]$ and α, γ are the solutions of $\tan x = \dfrac{1}{\sqrt{3}}$ in $[0,2\pi]$, then	(r)	$\alpha - \gamma = \pi$
		(s)	$\alpha + \beta = 3\pi$
		(t)	$\beta + \gamma = 2\pi$

1.

A. 1. $A - (q, s), B - (p, t), C - (r, s, t)$

B. 2. $A - (q), B - (t), C - (p, q)$

C. 3. $A - (r, t), B - (t), C - (p, q)$

D. 4. $A - (p, q), B - (q, r), C - (r, s, t)$

Answer: A

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Column I		Column II	
(A)	$2\sin\theta\|\cos\theta\| = \dfrac{1}{\sqrt{2}}$	(p)	$\theta = 3\pi/8$
(B)	$2\cos 2\theta\cos 4\theta + 2\cos^2 2\theta - 1 = 0$	(q)	$\theta = 7\pi/8$
(C)	$8\cos^2\theta\sin\theta - 4\cos^2\theta - 2\sin\theta + 1 = 0$	(r)	$\theta = 2\pi/3$
(D)	$\sin 4\theta = \pm 1$	(s)	$\theta = \pi/6$

2.

A. A-(p,q), B-(p,q,r), C-(r,s), D-(p,q)

B. A-(r,s), B-(q,r), C-(r), D-(p,s)

C. A-(p),B-(q),C-(r),D-(s)

D. A-(s),B-(q,r),C-(r,s),D-(p,q)

Answer: A

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Exercise Subjective Type Questions

1. Find the number of solution of the equations

$$|\cot x| = \cot x + \frac{1}{\sin x}, \text{ when } \in [0, 2\pi]$$

2. Find the number of solution of the equations

$$\sin^3 x \cos x + \sin^2 x \cdot \cos^2 x + \sin x \cdot \cos^3 x = 1, \text{ when } x \in [0, 2\pi]$$

3. Find the number of solution of the equations

$$2^{\cos x} = |\sin x|, \text{ when } x \in [-2\pi, 2\pi]$$

4. Find the number of solution of the equations

$$|\cos x| = [x], \text{ (where [.] denotes the greatest integer function).}$$

5. Find the number of solution of the equations

$x + 2\tan x = \dfrac{\pi}{2}$, when $x \in [0, 2\pi]$

6. The equation $\sin^4 x + \cos^4 x + \sin 2x + \alpha = 0$ is solvable for

$-\dfrac{5}{2} \le \alpha \le \dfrac{1}{2}$ (b) $-3 \le \alpha < 1 - \dfrac{3}{2} \le \alpha \le \dfrac{1}{2}$ (d) $-1 \le \alpha \le 1$

7. If $32\tan^3 \theta = 2\cos^2 \alpha - 3\cos \alpha$ and $3\cos 2\theta = 1$ then the general value of α is

8. Solve the following system of simultaneous equation for x and y.

$$4^{\sin x} + 3^{1/\cos y} = 11 \ 5 x 16^{\sin x} - 2 x 3^{1/\cos y} = 2$$

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9. Find all number x , y that satisfy the equation

$$\left(\sin^2 x + \frac{1}{\sin^2 x}\right)^2 + \left(\cos^2 x + \frac{1}{\cos^2 x}\right)^2 = 12 + \frac{1}{2}\sin y.$$

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10. Find $\dfrac{dy}{dx}$ if $3x - 5y = \sec x$

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11. Solve for x and y , $1 - 2x - x^2 = \tan^2(x + y) + \cot^2(x + y)$.

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12. Solve the system of equations

$$\tan^2 x + \cot^2 x = 2\cos^2 y$$

$$\cos^2 y + \sin^2 z = 1$$

13. Find all the pairs of x,y that satisfy the equation

$$\cos x + \cos y + \cos(x + y) = -\frac{3}{2}$$

14. Solve the equation $\cot\left(\frac{\theta}{2}\right) - \csc\left(\frac{\theta}{2}\right) = \cot\theta$

15. Find the general solution of $1 + \sin^3 x + \cos^3 x = \frac{3}{2}\sin 2x$

16. Solve $\log_{(\sin x)} 2 \log_{(\sin^2 x)} a = -1$ stating any condition on a' that may be required for the existence of the solution.

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17. Cosider the equation $\int_0^x (t^2 - 8t + 13) dt = x \sin(a/x)$

One of the solutions of $[y - \cos a] < x$, where x and a are values that satisfy the given equation, is

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18. If $\tan x = \dfrac{b}{a}$, find the value of $(a \cos 2x + b \sin 2x)$.

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19. Find all number of pairs x,y that satisfy the equation $\tan^4 x + \tan^4 y + 2\cot^2 x \cdot \cot^2 y = 3 + \sin^2(x + y)$.

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20. Determine all value of 'a' for which the equation $\cos^4 x - (a + 2)\cos^2 x - (a + 3) = 0$, possess solution.

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21. For $x \in (-\pi, \pi)$ find the value of x for which the given equation $\left(\sqrt{3}\sin x + \cos x\right)^{\sqrt{\sqrt{3}\sin 2x - \cos 2x + 2}} = 4$ is satisfied.

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22. Show that the equation , $\sec\theta + \csc\theta = c$ has two roots between 0 and 2π, if $c^2 < 8$ and four root if $c^2 > 8$.

23. Solve the equation for X and y ,

$$|\sin x + \cos x|^{\sin^2 x - 1/4} = 1 + |\sin y| \text{ and } \cos^2 y = 1 + \sin^2 y.$$

Exercise Questions Asked In Previous 13 Years Exam

1. Let $S = \left\{ x \in (-\pi, \pi) : x \neq 0, \pm \dfrac{\pi}{2} \right\}$. The sum of all distinct

solutions of the equation $\sqrt{2}\sec x + \cos ecx + 2(\tan x - \cot x)$

$= 0$ in the set S is equal to

A. $-\dfrac{7\pi}{9}$

B. $-\dfrac{2\pi}{9}$

C. 0

D. $\dfrac{5\pi}{9}$

Answer: C

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2. The number of distinct solution of the equation $\frac{5}{4}\cos^2 2x + \cos^4 x + \sin^4 x + \cos^6 x + \sin^6 x = 2$ in the interval $[0, 2\pi]$ is _____.

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3. For $x \in (0, \pi)$ the equation $\sin x + 2 \sin 2x - \sin 3x = 3$ has

   A. infinitely many solutions

   B. three solutions

   C. one solutions

   D. no solutions

Answer: D

4. Let $\varphi, \phi \in [0, 2\pi]$ be such that

$$2\cos\theta(1 - \sin\phi) = \sin^2\theta\left(\frac{\tan\theta}{2} + \cot\theta/2\right)\cos\phi - 1, \tan(2\pi - \theta) > 0$$

and $-1 < \sin\theta < -\dfrac{\sqrt{3}}{2}$ then φ lies between

A. $0 < \phi < \dfrac{\pi}{2}$

B. $\dfrac{\pi}{2} < \phi < \dfrac{4\pi}{3}$

C. $\dfrac{4\pi}{3} < \phi < \dfrac{3\pi}{2}$

D. $\dfrac{3\pi}{2} < \phi < 2\pi$

Answer: A::C::D

5. about to only mathematics

A. $P \subset Q$ and $Q - P \neq \phi$

B. $Q \not\subset P$

C. $P \not\subset Q$

D. $P = Q$

Answer: D

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6. The positive integer value of $n > 3$ satisfying the equation $\dfrac{1}{\sin\left(\frac{\pi}{n}\right)} = \dfrac{1}{\sin\left(\frac{2\pi}{n}\right)} + \dfrac{1}{\sin\left(\frac{3\pi}{n}\right)}$ is

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7. The number of values of θ in the interval $\left(-\dfrac{\pi}{2}, \dfrac{\pi}{2}\right)$ such that $\theta \neq \dfrac{n\pi}{5}$ for $n = 0, \pm 1, \pm 2$ and $\tan\theta = \cot 5\theta$ as well as $\sin 2\theta = \cos 4\theta$ is _____.

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8. The number of solutions of the pair of equations $2\sin^2\theta - \cos 2\theta = 0$

$2\cos^2\theta - 3\sin\theta = 0$ in the interval $[0, 2\pi]$ is

A. 0

B. 1

C. 2

D. 4

Answer: C

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9. The set of values of θ satisfying the inequatioin

$2\sin^2\theta - 5\sin\theta + 2 > 0$, where $o < \theta < 2\pi$, is

A. $\left(0, \dfrac{\pi}{6}\right) \cup \left(\dfrac{5\pi}{6}, 2\pi\right)$

B. $\left[0, \dfrac{\pi}{6}\right] \cup \left[\dfrac{5\pi}{6}, 2\pi\right]$

C. $\left[0, \dfrac{\pi}{3}\right] \cup \left[\dfrac{2\pi}{3}, 2\pi\right]$

D. None of the above

Answer: A

10. If $0 \leq x \leq 2\pi$, then the number of real values of x, which satisfy the

equation $\cos x + \cos 2x + \cos 3x + \cos 4x = 0$, is

A. 3

B. 5

C. 7

D. 9

Answer: C

11. The possible values of $\theta \in (0, \pi)$ such that $\sin(\theta) + \sin(4\theta) + \sin(7\theta) = 0$ are

(1) $\dfrac{2\pi}{9}, \dfrac{i}{4}, \dfrac{4\pi}{9}, \dfrac{\pi}{2}, \dfrac{3\pi}{4}, \dfrac{8\pi}{9}$ (2)

(3) $\dfrac{\pi}{4}, \dfrac{5\pi}{12}, \dfrac{\pi}{2}, \dfrac{2\pi}{3}, \dfrac{3\pi}{4}, \dfrac{8\pi}{9}$

$\dfrac{2\pi}{9}, \dfrac{\pi}{4}, \dfrac{\pi}{2}, \dfrac{2\pi}{3}, \dfrac{3\pi}{4}, \dfrac{8\pi}{9}$

(2) $\dfrac{2\pi}{9}, \dfrac{\pi}{4}, \dfrac{\pi}{2}, \dfrac{2\pi}{3}, \dfrac{3\pi}{4}, \dfrac{35\pi}{36}$ (4)

A. $\dfrac{2\pi}{9}, \dfrac{\pi}{4}, \dfrac{4\pi}{9}, \dfrac{\pi}{2}, \dfrac{3\pi}{4}, \dfrac{8\pi}{9}$

B. $\dfrac{\pi}{4}, \dfrac{5\pi}{12}, \dfrac{\pi}{2}, \dfrac{2\pi}{3}, \dfrac{3\pi}{4}, \dfrac{8\pi}{9}$

C. $\dfrac{2\pi}{9}, \dfrac{\pi}{4}, \dfrac{\pi}{2}, \dfrac{2\pi}{3}, \dfrac{3\pi}{4}, \dfrac{35\pi}{36}$

D. $\dfrac{2\pi}{9}, \dfrac{\pi}{4}, \dfrac{\pi}{2}, \dfrac{2\pi}{3}, \dfrac{3\pi}{4}, \dfrac{8\pi}{9}$

Answer: A

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12. The number of values of x in the interval $[0, 3\pi]$ satisfying the equation $2 \sin^2 x + 5 \sin x - 3 = 0$ is

A. 6

B. 1

C. 2

D. 4

Answer: D

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